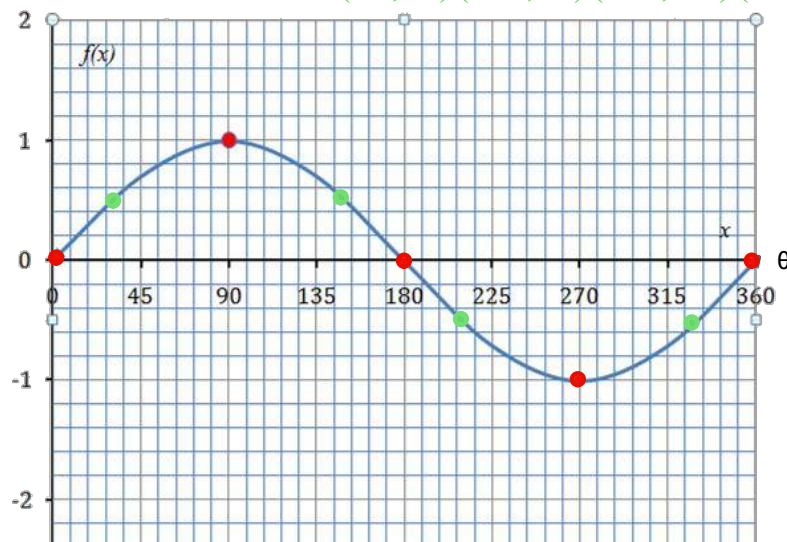


5.4 Translations of Sine Functions

Recall the graph of $f(x) = \sin \theta$

5 Key points: $(0^\circ, 0)$ $(90^\circ, 1)$ $(180^\circ, 0)$ $(270^\circ, -1)$ $(360^\circ, 0)$

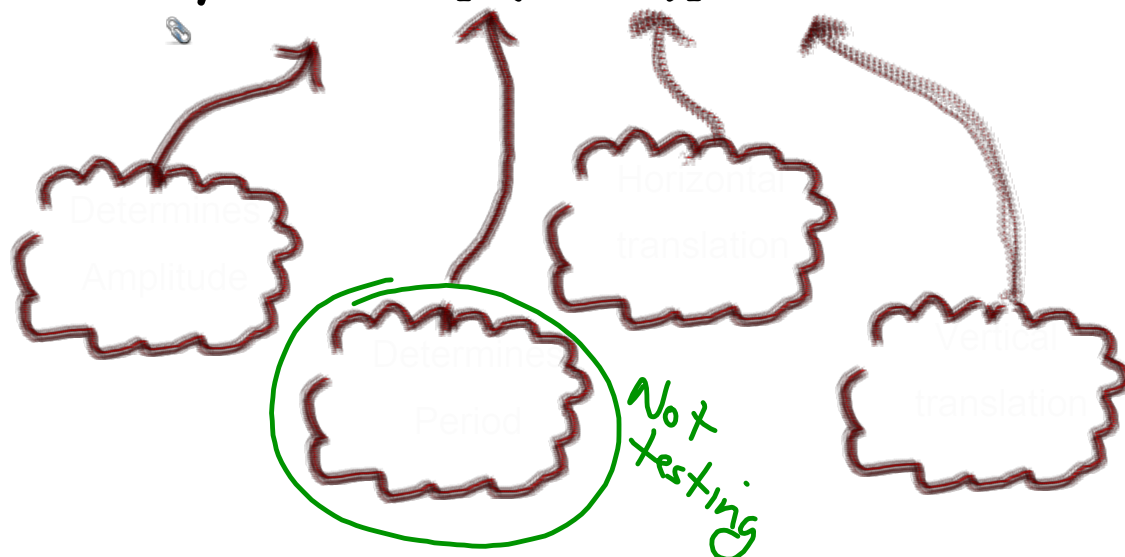
Extra Points: $(30^\circ, 0.5)$ $(150^\circ, 0.5)$ $(210^\circ, -0.5)$ $(330^\circ, -0.5)$



Translation of the sin Function

The sine function may be transformed by introducing factors a , k , d , and c :

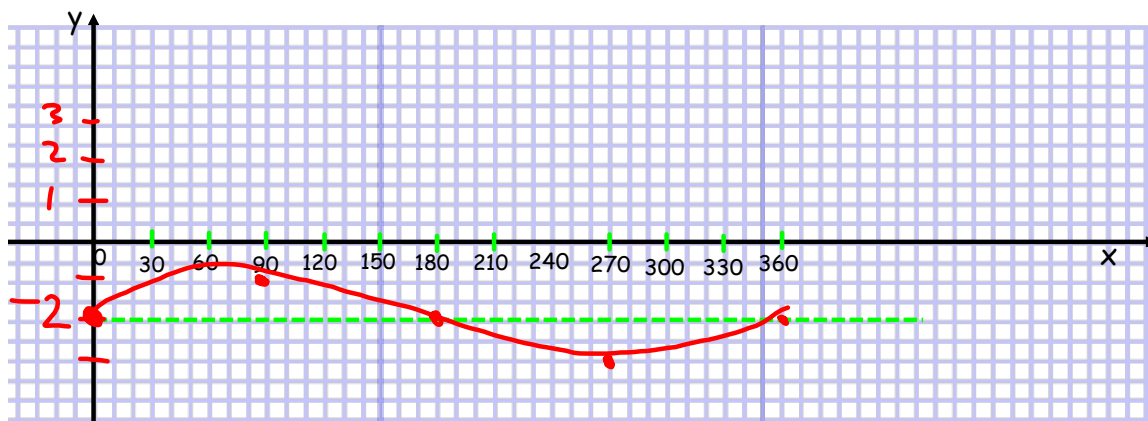
$$y = a \sin [k(x - c)] + d$$



5.4 Translations of Sine Functions

Ex 1: Vertical Translations

a) Graph $y = \sin x - 2$ as a transformation of the function $y = \sin x$, for one full cycle.



b) What are the domain and the range of the new function?

$$D = \{x \mid 0 \leq x \leq 360; x \in \mathbb{R}\}$$

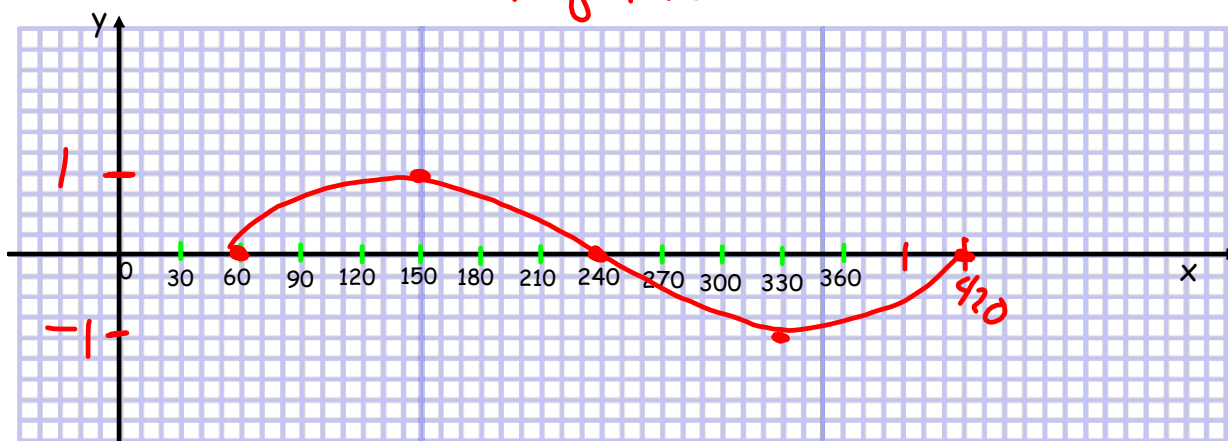
$$R = \{y \mid -3 \leq y \leq -1; y \in \mathbb{R}\}$$

c) State the: equation of the axis $f(x) = -2$ amplitude 1 period 360°

Ex 2: Horizontal translations:

a) Graph $f(x) = \sin(x - 60)$ as a transformation of the function $f(x) = \sin x$,

Moves Right 60°



b) What are the domain and the range of the new function?

$$D = \{x \mid 60 \leq x \leq 420; x \in \mathbb{R}\}$$

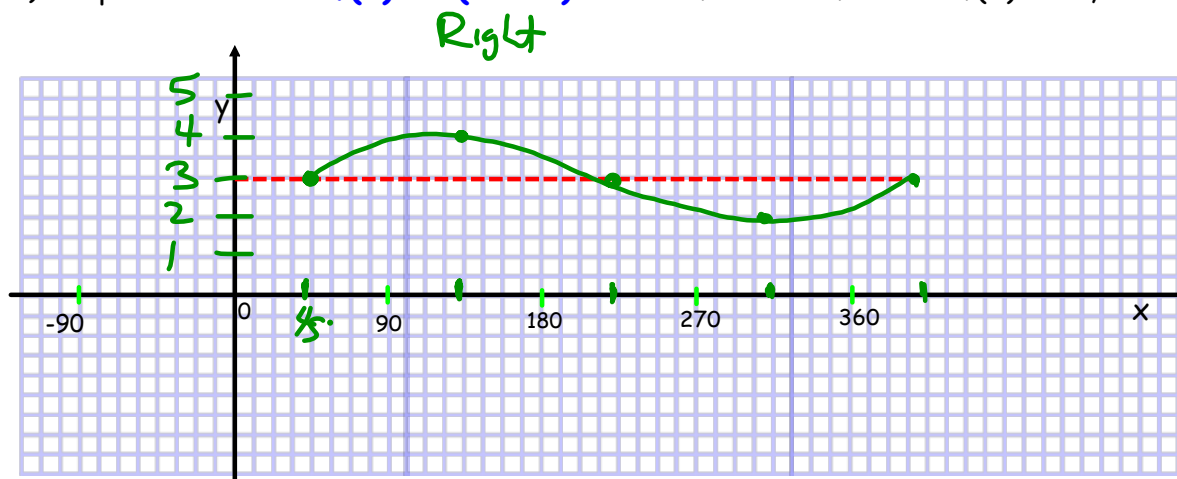
$$R = \{y \mid -1 \leq y \leq +1; y \in \mathbb{R}\}$$

c) State the:

• equation of the axis $f(x) = 0$

• amplitude 1

• period 360°

Ex 3: Combination of horizontal and vertical translationsa) Graph the function $f(x) = \sin(x - 45^\circ) + 3$ transform the function $f(x) = \sin x$,

b) What are the domain and the range of the new function?

$$D = \{x \mid 45 \leq x \leq 405; x \in \mathbb{R}\}$$

$$R = \{y \mid 2 \leq y \leq 4; y \in \mathbb{R}\}$$

c) State the equation of the axis, amplitude, and the period of the new function

$$f(x) = 3 \quad 1 \quad 360^\circ$$

Ex 4: Creating an equation from the description of transformations:a) The graph of $y = \sin x$ has been translated:-to the right 30°

-up 5 units.

Write the new equation:

$$f(x) = \sin(x - 30^\circ) + 5$$

b) The graph of $y = \sin x$ has been translated:-to the right 73°

-down 3 units.

Write the new equation:

$$f(x) = \sin(x - 73) - 3$$

c) The graph of $y = \sin x$ has been translated:-to the left 20°

-up 3 units.

Write the new equation:

$$f(x) = \sin(x + 20) + 3$$

d) The graph of $y=\sin x$ has been translated:

-to the left 0°

-down 6 units.

Write the new equation: $f(x) = \sin x - 6$

e) The graph of $y=\sin x$ has been translated:

-to the right 90°

-down 12 units.

Write the new equation: $f(x) = \sin(x - 90) - 12$

f) The graph of $y=\sin x$ has been translated:

-to the left 2°

-up 0.5 units.

Write the new equation: $f(x) = \sin(x + 2) + 0.5$

Hmwk:

p365

1, 3, 4 cd, 5cd, 8, 10, 12, 14, 16

unwind unit and transformwaves.GSP